



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|------------------------|------------------|
| 10/801,651 | 03/17/2004 | Jeong-Hwan Yang | SEC.1148 | 1694 |
| 20987 | 7590 | 04/04/2005 | EXAMINER | |
| VOLENTINE FRANCO, & WHITT PLLC ONE FREEDOM SQUARE 11951 FREEDOM DRIVE SUITE 1260 RESTON, VA 20190 | | | LINDSAY JR, WALTER LEE | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2812 | |

DATE MAILED: 04/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/801,651

Applicant(s)

YANG, JEONG-HWAN

Examiner

Walter L. Lindsay, Jr.

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 1-9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 10-14 and 16-18 is/are rejected.
- 7) ☒ Claim(s) 15 and 19-25 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

This Office Action is in response to an Election filed on 1/24/2005.

Currently, claims 1-25 are pending. Claims 1-9 have been withdrawn.

Election/Restrictions

1. Applicant's election without traverse of claims 10-25 in the reply filed on 1/24/2005 is acknowledged.
2. Claims 1-9 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected method, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 1/24/2005.

Specification

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

4. Claim 20 is objected to because of the following informalities: "is" in line 2, should be removed from the claim language. Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 10-14, 16 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Forbes (U.S. Patent No. 5,879,996 dated 3/9/1999).

Forbes shows the structure as claimed in Figs. 1a-1c and corresponding text as: the channel comprises an inner portion (118) and an outer portion (110) (col. 3, lines 16-39); the outer portion surrounds the inner portion (col. 3, lines 26-39); and the inner portion and the outer portion have different lattice properties (col. 3, lines 26-39) (claim 10). Forbes teaches that the inner portion comprises silicon-germanium and the outer portion comprises silicon (col. 3, lines 26-39) (claim 11). Forbes teaches that the outer portion surrounds the inner portion on at least three sides (col. 3, lines 26-39) (claim 12). Forbes teaches that a gate (122) formed over the channel (col. 3, lines 48-58) (claim 13). Forbes teaches that the gate is substantially perpendicular to the channel (col. 3, lines 48-58) (claim 14). Forbes teaches that a gate oxide (114) is formed between the channel and the gate (col. 3, lines 48-58) (claim 16). Forbes teaches that the thickness of the inner portion is between 10 nm and 90 nm (col. 3, lines 26-39) (claim 18).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Forbes (U.S. Patent No. 5,879,996 dated 3/9/1999) in view of Besser et al. (U.S. Patent No. 6,867,428 filed 10/29/2002).

Forbes shows the structure substantially as claimed in the preceding paragraphs.

Forbes lacks anticipation only in not explicitly teaching that: 1) a metal silicide layer is formed on a top surface of the gate (claim 17).

Besser shows the formation of silicide contacts on the gate structure with an underlying silicon germanium layer. Fig. 3i shows the structure after removal of the protective gate cap to expose the upper surface of the gate (54) followed by formation of silicide contacts 74 on the source and drain regions 72 and formation of a silicide contact 76 on the gate 54 (col. 6, lines 28-40). The metal used can be cobalt and nickel (col. 6, lines 28-40). The structure provides an increase of mobility of 80% or more for electrons and 20% or more for holes. The increase in mobility has been found to persist for current fields up to 1.5 megavolts/centimeter. Also the speed increases and the power consumption is reduced.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the structure of Forbes, by forming a metal silicide layer

Art Unit: 2812

is formed on a top surface of the gate, as taught by Besser, with the motivation that Besser teaches that an increase of mobility and speed and the reduction of power consumption can be realized by the structure of Besser.

Allowable Subject Matter

9. Claims 15 and 19-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: the prior art, either singly or in combination fails to anticipate or render obvious, the limitations of:

...wherein the gate surrounds at least a section of the channel on at least three sides, as required by claim 15, as it depends on claim 10;

...wherein the thickness of the outer portion is between 10 nm and 100 nm, as required by claim 19, as it depends on claim 10;

...wherein the outer portion includes a layer is formed between the inner portion and the semiconductor substrate, as required by claim 20, as it depends on claim 10;

...wherein the layer comprises silicon, as required by claim 21, as it depends on claim 20;

...wherein the layer is strained silicon, as required by claim 22, as it depends on claim 21;

...wherein the layer comprises approximately the same lattice property as the outer portion, as required by claim 23, as it depends on claim 20;

...wherein the thickness of the layer is between 10 nm and 30 nm, as required by claim 24, as it depends on claim 20;

...the semiconductor substrate comprises a source region and a drain region;
and

the channel is coupled to the source region and the drain region, as required by claim 25, as it depends on claim 20.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter L. Lindsay, Jr. whose telephone number is (571) 272-1674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2812

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Walter L. Lindsay, Jr.
Examiner
Art Unit 2812

WLL

March 23, 2005

